

### REMARKS

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Claims 2, 3, 6, 7, 9, 15, 24, 27 and 28 are currently being amended. No new matter is added.

This amendment adds, changes and/or deletes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claims remain under examination in the application, is presented, with an appropriate defined status identifier.

After amending the claims as set forth above, claims 1-15 and 24-31 remain pending in this application.

In paragraph 1 of the Office Action, the Examiner has objected to claims 2-3 under 37 CFR 1.75(c). Applicants have amended claims 2-3 for clarity according to the Examiner's comments. Applicants note that claims 2 and 3 are dependent upon claim 1 which the Examiner indicated is allowable. Accordingly, an indication of allowance of claims 2 and 3 is respectfully requested.

In paragraphs 2-3 of the Office Action, claims 7, 12, and 14 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,271,154 (Shen). The Examiner states:

Respect to claim 7, Shen discloses the process comprising the steps of:

patterning a feature on a photoresist layer (16") disposed over a substrate, the feature patterned in according with a patterned provided on a mask with UV radiation (col. 4 lines 53-67);

developing the photoresist layer, the patterned photoresist layer including at least one feature having a top surface and side surface (Fig 4);

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exposing the photoresist layer to a argon densifier (col. 5, lines 20-45)

transforming the top surface and side surface with the densifier to form a harden surface (40) (Fig 5);

etching the substrate in according the transform feature, wherein the exposing step occurs after the developing step and before the etching step (fig 6).

Shen does not explicitly discloses that the etch stability of the feature is a function of the harden surface. However, Shen discloses identical process steps and use the same material as applicants' invention. The examiner therefore concludes that the it is inherently that etch stability of the feature is a function of the harden surface in Shen's reference. Further, the MPEP 2112 states, "The claiming of a new use, new function or unknown property which is inherently present in the prior art does not necessarily make the claim patentable."

Applicants respectfully traverse the rejection.

In paragraphs 4-6 of the Office Action, claims 7-8, 11-24, 24-26, 29 and 31 are rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 5,876,903 (Ng) in view of U.S. Patent No. 6,054,254 (Sato). The Examiner states:

Respect to claim 7, Ng discloses the process comprising the steps of:

patterning a feature on a photoresist layer (70) disposed over a substrate, the feature patterned in according with a patterned provided on a mask (74) with UV radiation (col. 1 lines 20-24 and col. 4 lines 15-34, Fig 7);

developing the photoresist layer, the patterned photoresist layer including at least one feature having a top surface and side surface (Fig 8);

exposing the photoresist layer to a argon densifier (col. 4, lines 35-45)

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transforming the top surface and side surface with the densifier to form a harden surface (86) (Fig 9);

etching the substrate in according the transform feature, wherein the exposing step occurs after the developing step and before the etching and etch stability is due to the harden surface (86).

Ng does not explicitly disclose the radiation is at deep UV. However, Ng clearly discloses the radiation is at UV wavelength (col. 1, lines 20-05). Sato discloses the radiation is at 248 nm or 222 nm (read on "deep ultraviolet"; col. 49, lines 5-15). It would have been obvious to one having ordinary skill in the art, at the time of invention, to perform at deep UV radiation because this would create a fine pattern dimension.

Applicants respectfully traverse the rejection.

In paragraph 7 of the Office Action, claims 24-29 and 31 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,207,583 (Dunne) in view of Sato. The Examiner states:

Respect to claim 24, Dunn discloses a method comprising of using a feature on the photoresist layer (18) disposed above a layer or a substrate, the feature was lithographically patterned using a ultraviolet wavelength (col. 6, lines 1-5, Fig 1c, Fig 5a);:

transforming the exposed surface to be structurally denser (i.e. shell 22 or 43) than the un-treated region form a shell (22 or 43) using fluorine implantation (col. 8, Fig 1d, Fig 5b);

etching the layer of the substrate according to the feature (Fig 1d, 5b).

Dunne fails to disclose the specific thickness of the photoresist layer. In a semiconductor process, Sato discloses a photoresist layer (8) having a thickness of 200 nm is sufficient to act as a mask (col. 74 lines 17-21; Note: 200 nm = 0.2  $\mu$ m; read on "thickness less than 0.25  $\mu$ m"). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Dunne in view of Sato by having the thickness less than 0.25  $\mu$ m because it would be sufficient to act as a mask.

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Dunne also does not explicitly disclose the radiation is at deep UV. However, Dunne clearly discloses the radiation is at UV wavelength. Sato discloses the radiation is at 248 nm or 222 nm (read on "deep ultraviolet"; col. 49, lines 5-15). It would have been obvious to one having ordinary skill in the art, at the time of invention, to perform at deep UV radiation because this would create a fine pattern dimension.

Applicants respectfully traverse the rejection.

In paragraph 8 of the Office Action, claim 30 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Dunne, Sato and U.S. Patent No. 6,319,655 (Wong). The Examiner states:

Sato teaches the polymer photoresist is lithographically patterned using 193 nm wavelength (col. 49 lines 10-15). However, Dunne and Sato fail to disclose that the photoresist comprises an acrylate or alicyclic polymer. Wong teaches the photoresist layer comprises acrylate or alicyclic polymer and it is patterned using light at having a wavelength at 193 nm. It would have been obvious to one having ordinary skill in the art, at the time of invention, to use acrylate or alicyclic polymer because this would increase etch resistance of the photoresist layer.

Applicants respectfully traverse the rejection.

In paragraph 9 of the Office Action, Claim 30 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Ng, Sato, and Wong. The Examiner states:

Sato teaches the polymer photoresist is lithographically patterned using 193 nm wavelength (col. 49 lines 10-15). However, Ng and Sato fail to disclose that the photoresist comprises an acrylate or alicyclic polymer. Wong teaches the photoresist layer comprises acrylate or alicyclic polymer and it is patterned using light at having a wavelength at 193 nm. It would have been obvious to one having ordinary skill in the art, at the time of invention, to use acrylate or alicyclic polymer because this would increase etch resistance of the photoresist layer.

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Applicants respectfully traverse the rejection. Ng, Sato, Wong, Dunne, and Shen are referred to below as cited art.

In paragraph 10 of the Office Action, the Examiner indicates that claims 1 and 4-6 are allowed. The Examiner objected to claim 3. As discussed above, claim 3 has been amended to overcome the Examiner's objection. Accordingly, an indication of allowance of claim 3 (as well as claim 2) is respectfully requested. Claim 6 has been amended for clarity. Applicants respectfully submit that claims 1-6 are allowable over the cited art.

In paragraph 12 of the Office Action, the Examiner indicated that claims 9-10, 15, and 27-28 would be allowable if rewritten in independent form. Applicants have amended claim 7 to include the limitation of objected to claim 9. Claim 9 has been amended to include a different limitation. Accordingly, it is respectfully submitted that claim 7 and its dependent claims 8-14 are patentable over the cited art.

Claim 15 has been amended to be in independent form. Accordingly, it is respectfully submitted that claim 15 is now in condition for allowance. Claim 24 has been amended to include the limitation of claim 27. Claim 27 has been amended to include a different limitation, and claim 28 has been amended to change its dependency. Accordingly, it is respectfully submitted that claim 24 and its dependent claim 25-31 are patentable over the cited art.

Accordingly, it is respectfully submitted that all pending claims (claims 1-15 and 24-31) are now allowable over the cited art.

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

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The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 06-1447. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 06-1447. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicants hereby petition for such extension under 37 C.F.R. § 1.136 and authorizes payment of any such extensions fees to Deposit Account No. 06-1447.

Respectfully submitted,

Date

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By

Joseph N. Ziebert

FOLEY & LARDNER LLP  
Customer Number: 26371  
777 East Wisconsin Avenue  
Milwaukee, Wisconsin 53202-5306  
Telephone: (414) 297-5768  
Facsimile: (414) 297-4900

Joseph N. Ziebert  
Attorney for Applicants  
Registration No. 35,421